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A REVIEW PAPER ON POWER GENERATION USING REGENEDYNE MAGLEV
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ABSTRACT

This review paper dwells on the implementation of an alternate configuration of a wind turbine for power generation functions. Exploitation the consequences of magnetic repulsion, spiral formed wind turbine blades are fitted on a rod for stability throughout rotation and suspended on magnets as a replacement for ball bearings that are usually used on standard wind turbines. Power can then be generated with an axial flux generator, which includes the utilization of permanent magnets and a group of coils. The choice of magnet materials within the style of wind turbine system is mentioned. A model of turbine is constructed to perform many tests such as beginning wind speed, rotational speed at constant wind speed, and time taken to prevent rotation utterly. Pressure of the field is employed to suppress the result of gravitational and different forces. As wind may be a style of renewable supply of energy, it will be wont to generate electricity by changing kinetic energy into electric energy with the assistance of turbine. The advantage of a magnetic levitation windmill over a traditional one is, mechanical friction is completely eliminated because the rotor is floating within the air because of levitation.

Keywords: *Maglev, Magnetic levitation, power generation, VAWT.*

I. INTRODUCTION

Energy consumption is a measure of prosperity. As we know India is one of the fastest developing countries, so energy consumption is quite more in India. Although India's per capita energy consumption is one in every of all-time low (and a lot of under developed countries) India still ranks fourth largest energy overwhelming nation within the world per the most recent report free by U.S Energy info & Administration. The very much important aspect of doing any work is Energy. Therefore in the era of high energy consumption it is a need to produce energy which is sustainable, climate friendly and don't have any adverse influence on environment.

We create energy by using renewable and non-renewable sources. The renewable energy is those which can be used repeatedly and are unlimited. Such are solar energy, wind energy and tidal energy. As we know non-renewable sources are limited therefore it's a need to switch over to renewable sources.

Our review paper aims to power generation using Regenedyne maglev wind turbine techniques. The word Regenedyne means generation by renewable Source (wind). Maglev wind turbines have many blessings over standard wind turbines. As an example, they're able to use winds with beginning speeds as low as 1.5 meters per second (m/s). Also, they may operate in winds prodigious 40m/s. presently the most important standard wind turbines within the world manufacture solely 5 megawatts of power. However, one massive magnetic levitated turbine might generate one GW of unpolluted power, enough to produce energy to 750,000 homes [7].

Wind turbines are divided into two main types: a) Horizontal axis wind turbine (HAWT).

b) Vertical axis wind turbine (VAWT). The main advantage of using VAWT is that it can absorb wind from all directions without the requirement of a yawing mechanism. The need to pitch the blades for compensating fluctuations in wind speed is not required. These above two factors make VAWT simpler in designing, in building and in maintaining as compared to HAWT. VAWTs are not as noisy as HAWTs.

At the wind power Asia exhibition, Beijing 2007 first Regenedyne maglev wind turbine was unveiled. The word Maglev is derived from words Magnetic Levitation. In this technique magnetic levitation is work on repulsion characteristics of permanent magnets. This maglev technology is widely used in maglev trains. Then there is review of results. The main parts of the system are the magnetic levitation zone, blade hub and generator. It'll convert the mechanical energy from the wind to the electricity for usage. The paper gives overview of mechanical structure designing and system components.

II. SYSTEM COMPONENTS

1. Neodymium Magnets

The Neodymium element is initially separated from refined Rare Earth oxides in an electrolytic furnace. The Neodymium, Iron and Boron are measured out and put in a vacuum induction furnace to form an alloy. Other elements are also added, as required for specific grades e.g. Cobalt, Copper, Gadolinium and Dysprosium (e.g. to assist with corrosion resistance)[6]. It is a tetragonal crystalline structure.



Fig 1 Ring and disc type magnets

2. Coil

43 gauge wires of 2500 turns every square measure used as coils for power generation. Twenty four sets of such coils utilized in the example. These coils organized within the bound of the stator specifically in a very line to the organized disc magnets. The coils rose to a certain height for max utilization of the magnetic flux. Every set of such coils connected nonparallel (series) to get most output voltage. The series association of the coils is most popular over the parallel association for optimizing level between the output current and voltage.

3. Wind Sail

In the construction of maglev windmill basic requirement is of designing of sails. Sails are the one of important part of the wind turbine. Generally Savonius model is used which is simply a VAWT. Aluminium sheets, PVC pipes or acrylic sheets are used for designing the blades.

4. Rotor

Rotor is activating half or could say rotating half that rotates in keeping with wind speed. The rotor has circular disk placed upward and downward and in between that blades are placed. These blades are placed at 45° angles apart from each other. This mounting makes the blades to rotate even at little wind speed.

5. Stator

It is the stationary part of the wind turbine. A permanent magnet is placed in the center of a stator and several coils are on the periphery of the stator.

1. Magnets and Coil arrangements:

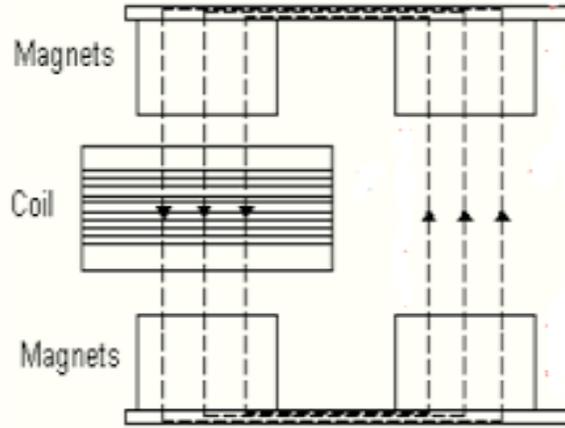


Fig. 5 Magnet and Coil arrangement

As we know more windings will increase voltage produce by each coil but it will also increase size of coils. Increased thickness of a coil decreases the distance between the two magnets, results the reduction in magnetic flux.



Fig.6 Magnet placing on stator

The two neodymium ring type magnets (NdFeB) are placed at the centre of shaft, placing alike poles facing each other producing repulsion which is necessary for magnetic levitation between stator and rotor of wind turbine. Similar Disc type magnets are arranged as alternate poles one after the other, along the periphery of the rotor made of plywood [6]. These disc magnets are responsible for the useful flux which is going to be utilized for power generation.

2. Coil Polarity

Lenz's law states that the induced electromotive force is usually opposing the initial modification in flux. This law can facilitate make a case for the direction of current flow in every coil. In an axial flux generator the magnets flow over every coil producing a dynamical magnetic flux. As a personal magnet enters the zone of a coil, the coil produces a magnetic flux opposing the magnets; successively a current flows during a direction in keeping with the right hand rule. Once a magnet is positioned directly over a coil the magnetic flux made by the coil equals the magnetic flux made by the magnet, thus the voltage can attend zero and no current flows at this instant.

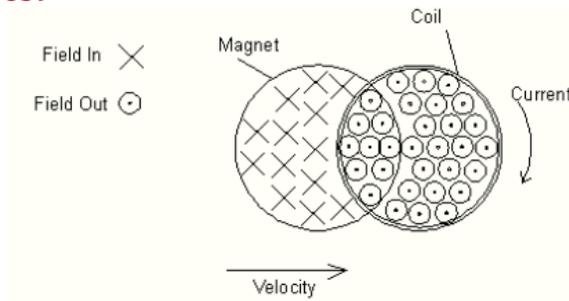


Fig. 7 Magnets entering coil region

When the magnet finally exits the zone of the coil, the coil currently produces a field that coincides with the direction of the magnet. This successively produces a current that flows within the opposite direction that it absolutely was originally flowing once the magnet entered the region.

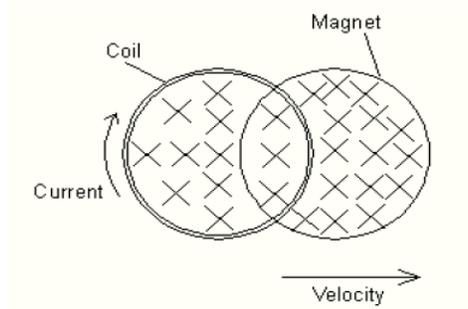


Fig. 8 Magnets exiting coil region

3. Final Assembly

After all single arrangement all components are assembled for the final model of Regenedyne maglev wind turbine.

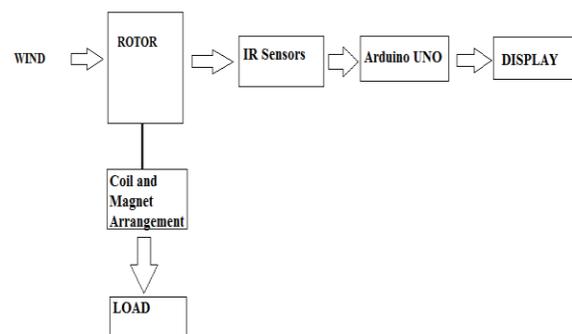


Fig. 9 Block diagram of final assembly

IV. WORKING PRINCIPLE

1. Magnetic Levitation

Magnetic levitation is operating on repulsion characteristics of permanent magnets. Here during this windmill neodymium magnets used for magnetic levitation. By putting 2 magnets on prime of every alternative with like polarities facing one another, the magnetic repulsion are robust enough to stay each magnets at a distance removed from one another. The force created as a result of this repulsion may be used for suspension functions and associated to robust enough to balance the burden of an object .In the designed epitome, the stator coil and rotor separated within the air mistreatment the principle of magnetic levitation. The rotor is upraised by a definite centimeters

within the air by the magnetic pull forces created by the ring type neodymium magnets. This arrangement is adding main advantage to Maglev Windmill that all mechanical friction is eliminated due to rotor floating in the air because of magnetic levitation, which makes rotation possible even at a low speed. Magnetic levitation is replacing ball bearing arrangement found in conventional horizontal axis wind turbine. The forces created by magnetic levitation are strong enough to balance the weight of a wind sail assembly. This repulsive force can be used as suspension purpose.

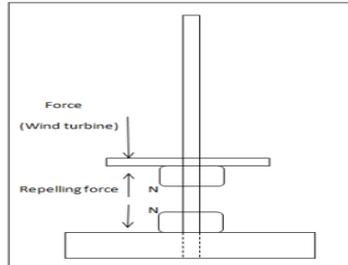


Fig. 10 Magnetic levitation

2. Final Working

The basic working rule of a turbine is once air moves quickly, within the kind of wind; the mechanical energy is captured by the turbine blades. The blades begin to rotate and spin a shaft that leads from the hub of the rotor to a generator and turn out electricity. The high speed shaft drives the generator to provide electricity. The low speed shaft of turbine is connected to shaft of high speed drives through gears to extend their rotational speed throughout operation. exploitation the consequences of magnetic repulsion, spiral formed turbine blades are going to be fitted on a rod for stability throughout rotation and suspended on magnets as a replacement for ball bearings that are usually used on standard wind turbines. IR sensors counts rotation of blades, signals the Arduino UNO which displays RPM of rotor.

V. WIND POWER TECHNOLOGY

Undoubtedly, the project's ability to perform is only obsessed on the ability of wind and its availableness. Wind is understood to be another style of solar power as a result of it comes regarding as a result of uneven heating of the atmosphere by the sun as well as the abstract topography of the earth's surface. With wind turbines, 2 classes of winds are relevant to their applications, specifically native winds and planetary winds. The latter is that the most dominant and it's sometimes a significant consider deciding sites for terribly effective wind turbines particularly with the horizontal axis varieties. These winds are sometimes found on shorelines, mountain super, valleys and open plains. The previous is that the sort you may notice in regular environments just like the town or rural areas, essentially wherever settlements are gift. This kind of wind isn't contributory for effective power generation; it solely includes a ton of value once it accompanies moving planetary winds. The alternative energy will increase as a function of the cube of speed of the wind and this power is countable with relevancy the realm within which the wind is gift in addition because the wind velocity. Once wind is processing the energy obtainable is kinetic because of the motion of the wind that the power of the wind is said to the Kinetic Energy.

We know:

$$\text{kinetic energy(k. E.)} = \frac{1}{2} mv^2 \dots\dots\dots (a)$$

Amount of Air passing is given by

$$m = \rho AV \dots\dots\dots (1)$$

Where

m = mass of air transverse

A=area swept by the rotating blades of wind mill type generator

ρ = Density of air

V= velocity of air

Substituting this value of the mass in equation (a)

$$K.E. = \frac{1}{2}(\rho AV)V^2$$

$$K.E. = \frac{1}{2}\rho AV^3 \dots\dots\dots (2)$$

To convert the energy to kilowatts, a non-dimensional quotient constant k is introduced where,

$$k = 2.14 * 10^{-3} \dots\dots\dots (b)$$

Therefore

$$\text{Power in KW } (P) = 2.14\rho AV^3 * 10^{-3}$$

Where, Air Density (ρ) = 1.2 kg/m^3

Area (A) = area swept by the blades of the turbine

Velocity (V) = wind speed. [9]

VI. ADVANTAGES

- 1) As we all know wind energy is one amongst renewable sources generating power turn out by these sources is useful because it is freed from value and has low maintenance.
- 2) It has no negative influence on surroundings, because it non-polluting.
- 3) The main edge of getting floating type rotor is that it provides resistance rotation
- 4) It would increase the generation capability by 20% and reduces operational value by 50% over typical wind turbines.

VII. APPLICATION

- 1) Maglev wind turbines can be installed across the public facilities such as street light, public parks lighting schemes, etc.
- 2) Maglev wind turbines will be able to supply road side lighting by making the use of air flow produce from vehicles passing by highways.

VIII. CONCLUSION

We know energy conservation is sort of more in India. Thus power generation victimization renewable sources is currently become the necessity of era. Thus regenedyne magnetic levitation wind turbines may be an excellent alternative for non renewable sources for power generation. The rotor and stator of turbine is levitated like it nullifies friction and permits smooth rotation. The one amongst the most advantage of this turbine is that it will rotate at low wind speed 1.5 meters per second (m/s) and conjointly rotate at high speed 40m/sec. Use of Savonius model turbine adscititious the advantages in wind absorbed from all directions neglecting the yawing mechanism. Power generation victimization regenedyne magnetic levitation turbine may be a kind of clean (“Green Energy”) energy. This model provides most voltage up to 7.6 V at 2150 rpm, for additional voltage solar panels on this model can add voltage up to 12V. Aluminium may be a Very light metal and it naturally generates a protecting coating of oxide and is also extremely immune to corrosion, thus blade created from aluminium will work effectively.

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